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Special Issue: Wave and tidal resource characterization

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The ocean represents a vast, and largely untapped, energy resource that could be exploited as a form of low carbon electricity generation. There has been much academic research, R&D, and commercial progress in marine renewable energy over the last decade. However, for the sector to flourish, and before electricity can be generated at significant scale, it is essential that the resource is fully, and accurately, characterized. This special issue comprises a range of articles relating to wave and tidal energy resource characterization in coastal waters throughout the world.

The special issue begins with a consideration of the wave and tidal resource of Scotland [1] – a nation that has been instrumental in the progress of the industry due to its energetic resource, and the foundation of the European Marine Energy Centre (EMEC) that has become a template for other test centres throughout the world. The next two articles consider country-scale wave and tidal resource assessments from two contrasting continents – the Uruguayan shelf seas [2] and, within the context of post-Fukushima,

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Japan [3].

It is interesting to note that the majority of accepted submissions (62%) examined waves, demonstrating the global interest and significance of this resource. These contributions include wave energy resource assessments that span the Middle East [4, 5], Australasia [6, 7], South America [8, 9], North America [10], and Europe [11, 12], considering issues such as model calibration [13], spatial/temporal variability [12], and wave/tide interaction [14].

A number of tidal stream resource assessments are included in the special issue, discussing the tidal resource of the Bosphorus [15], Puget Sound [16], the Massachusetts coast [17], Rathlin Sound in Northern Ireland [18], and the famous Pentland Firth [19]. These studies consider issues that include characterising the shape of the velocity profile at highly energetic sites [20], turbulence [21, 22], representing energy extraction in three-dimensional (3D) models [19, 23], the impact of waves on the tidal resource [24], and novel floating tidal devices [25]. It is notable that the majority of tidal resource assessments in the special issue that included a modelling component used 3D models as standard.

Finally, there was one contribution on tidal range power plants [26]. Although not a new concept (La Rance has been in operation since 1966), this technology has recently gained momentum, particularly in the UK, with the possible development of tidal lagoon power plants.

This special issue is comprised primarily from papers that were initially presented in the “Marine Renewable Energy: Resource Characterization, Environmental Impacts, and Societal Interactions” session at the 2016 AGU/ASLO/TOS Ocean Sciences Meeting in New Orleans, USA, 21-26 February 2016. How-

ever, due to the nature of the topic, many contributions that were not initially presented at this meeting are included in the special issue.

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